

Interactive comment on “Are contributions of emissions to ozone a matter of scale? – A study using MECO(n) (MESSy v2.50)” by Mariano Mertens et al.

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Please find our full reply attached

Interactive comment on Geosci. Model Dev. Discuss., <https://doi.org/10.5194/gmd-2019-7, 2019>.

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Dear referee#1,
thank you very much for your review of our manuscript GMD-2019-07. After our short comment we would like to reply to your review in detail. In the following, referee comments are given in italics, our replies in normal font, and text passages which we included in the text are in bold.

This paper presents an analysis of simulations at various horizontal resolutions, with emissions at various resolutions, and different emissions inventories.
Reply: To be more precise, our analysis focuses on diagnosed ozone contributions and uncertainties of these contributions, which arise due to model limitations (e.g. resolution, parametrisations), limited resolution of emission inventories, and uncertainties of the emission inventories. To make this more clear we revised the manuscript at several points (see below) and add also an addition Section (Sect. 2.1) which discuss the source apportionment in more detail.

The research is technically sound, and the application of source tagging and attribution is well illustrated. However, the paper does not seem to have any new results. The models and tagging technique used have all been published previously. The majority of their conclusions confirm previous work. Their strongest conclusion seems to be that different emissions inventories making the largest difference in ozone simulations, which I think is well known, but they do not offer any assessment about which might be more accurate. If the authors feel they have more compelling results, then they should make them much clearer.

Reply: First of all thank you very much for honouring our work. Indeed our analysis is very technical and focuses on the impact of technical limitations of models on the results of source apportionment diagnostics. However, we do not agree with referee#2 that our manuscript does not show any new results. Clearly, the dependence of simulated ozone concentrations on the resolutions of model and emissions are well known (see p14f, p28f of our manuscript), and where appropriate we cite previous literature. The focus of our manuscript, however, is not on simulated ozone concentrations but on **diagnosed contributions to ozone**. We are not aware of any previous publications, which investigate the impact of these factors on the results of a source apportionment (e.g. tagging) method. Further, we are not aware of any similar model system allowing for such an analysis, as it requires a consistent global-regional model chain applying the identical source-attribution method on the global and regional scale. Previous publications applying source attribution on the regional scale (e.g. Dunker et al., 2002; Li et al., 2012; Kwok et al., 2015; Valverde et al., 2016; Karanachandani et al., 2017) considered only the contributions as simulated by the regional model and are not able to attribute ozone transported from the stratosphere or across the lateral borders of the regional model domain to specific emission categories.

In addition, we would like to remark that publications in GMD are not primarily about presenting new scientific results. Publications in GMD are mainly to document model developments, document experimental set-ups of model simula-

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Fig. 1.

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